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Database with all the relevant data for the year 2020

D3.3

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LOCALISED

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List of Abbreviations

API	Application Programming Interface
DSP	Data Sharing Platform
EUCalc	European Calculator
LAU	Local Administrative Units
NUTS	Nomenclature of Territorial Units for Statistics - the acronym stems from French: Nomenclature des Unités Territoriales Statistiques
SDG	Sustainable Development Goal
SECAP	Sustainable Energy and Climate Action Plan
SOI	SDG Oriented Indicator
WP	Work Package

Executive Summary

The objective of the project LOCALISED is to downscale decarbonisation trajectories consistent with Europe's net-zero targets to local levels to support local authorities, businesses and citizens in speeding up the uptake of mitigation and adaptation actions. This downscaling to local level starts from the trajectories at country level and is a data intensive, non-trivial process. This document (D3.3 - Database with all the relevant data for the year 2020) is the outcome of Task T3.2 (Pan-European NUTS3-level database for disaggregation and climate change), which aims to collect datasets and assess their relevance and usefulness for the project. The database described in this deliverable build on internal feedback on a confidential deliverable (D3.2 - Database for 3 EU countries with relevant data for the year 2020) which focussed on data from 3 EU countries to examine the data sources, the data availability and quality as well as the data collection process. Those datasets were also used to discuss and assess the needs and the relevance of the data with other partners.

The implementation of LOCALISED is structured along different Work Packages (WPs), several of which need data provided at local level. Directly or indirectly, the collected data described in this deliverable is used in WP4 - Cross-sectoral mitigation and adaptation on the regional level - where a set of adaptation and mitigation measures for a region are identified; and in WP5 - Dynamic data and knowledge to concretize, implement and monitor local decarbonisation plans - for Sustainable Development Goals Oriented Indicators (SOIs) - that target public administrations businesses and cities. Data can be used indirectly by these WPs in the sense that the data is used in WP3 - Downscaled pathways for EU regions and data-sharing platform - for a spatial disaggregation from country level to local level of the decarbonisation pathway from EUCalc (European Calculator, https://www.european-calculator.eu/), which is then used by the other WPs. WP3 requires additional data, called proxy data, for performing the spatial disaggregation. Proxy data is data whose values and spatial distribution correlate with the data to be disaggregated and as such can help to increase its spatial resolution. WP4 and WP5 can then make use of this spatially disaggregated pathway data. A similar approach provides those WPs with data that was not available at the required spatial resolution. The data required in WP4 and WP5, the workflow and methodologies implemented to provide this data are described in detail in this deliverable.

The required data was gathered from several public databases, with Eurostat being the most prominent one. Furthermore, data for a couple of countries was collected from country-databases to provide data for validation of the spatial disaggregation method, being developed in the project. The year 2020 was selected as it is relatively recent, but old enough for the datasets to have stabilised i.e., the addition of more data for 2020 in the collected datasets is unlikely. Despite this, some data for 2020 was missing; depending on the availability, data from earlier or - if available - later years were

sourced. As a result, the collected data is a mix of data mainly from 2020, but including some datasets from earlier and later years - the year of the data is also kept in the database.

1 Introduction

This deliverable is the final outcome of Task T3.2 - Pan-European NUTS3-level Database for Disaggregation and Climate Change - of the LOCALISED project. The LOCALISED project aims to support local authorities, businesses and citizens in speeding up the uptake of mitigation and adaptation actions by providing local decarbonisation trajectories. Task T3.2 - Pan-European NUTS3-level Database for Disaggregation and Climate Change - concerns the gathering and processing of data relevant to other work packages; this is a part of WP3 - Downscaled pathways for EU regions and data-sharing platform. This task supports the Disaggregation Methodology and Working Disaggregation Tool which is planned to be released in March 2024. Data in this context refers to spatial datasets concerning not only social and economic factors, but also landuse and other statistics. A full list is provided in the appendix. Climate data and climate impact data were also gathered in the context of Task T2.3 - Climate and remote sensing data to inform adaptation and disaggregation - but due to its different nature, this data is separately presented in Deliverable D2.5 (Patil et al, 2023).

This Deliverable D3.3 - Database with all the relevant data for the year 2020 - provides a database populated with relevant non-climate related data of sufficient quality, where necessary through the developed spatial disaggregation in combination with additional datasets. This builds on the confidential Deliverable D3.2 - Database for 3 EU countries with relevant data for the year 2020 - which explored data sources as well as methodologies for data gathering, and assessed relevance of the datasets.

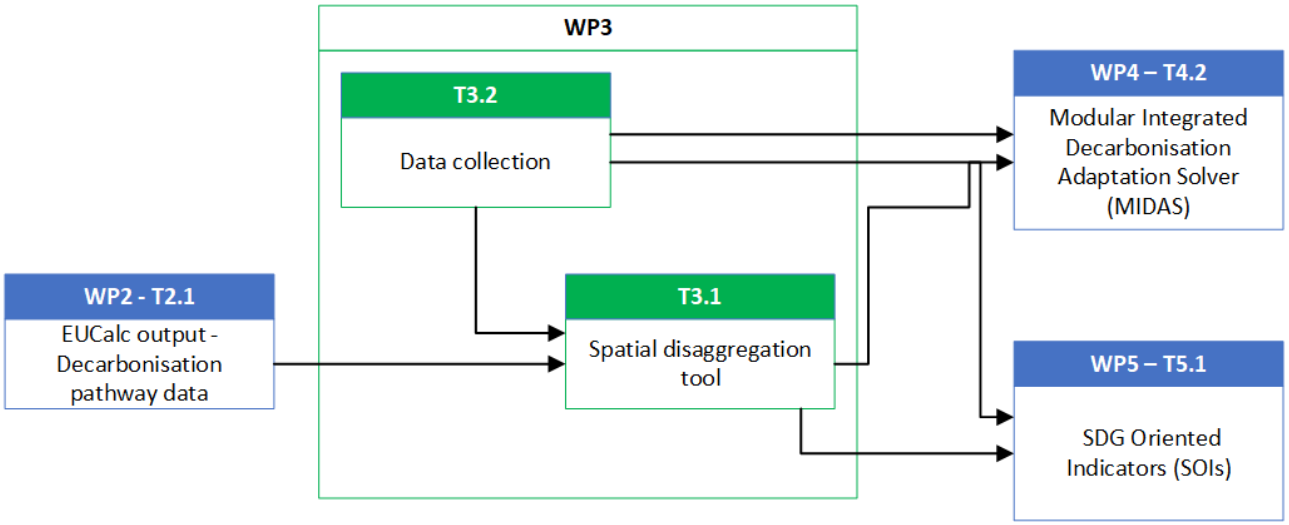

Figure 1: Interactions between different tasks of LOCALISED regarding the collected data.

Data from Task T3.2 is supplied to different tasks across different work packages, as depicted in Figure 1, for different purposes. Several datasets such as sectoral energy demand and emissions are required as input data in the Modular Integrated Decarbonisation Adaptation Solver (MIDAS) model[1]. In the model, this data serves as preconditions for the choice of adaptation and mitigation measures at a regional level. Most of the required data was obtained using the European Calculator (EUCalc) tool (Costa, 2022), which provides national-level decarbonisation pathway data. This data will have to be spatially disaggregated to regional level before it can be used by the MIDAS model; the spatial disaggregation tool will be developed for this purpose. Other datasets already have the required spatial resolution and can be directly fed into the MIDAS model. It is noteworthy that decarbonisation pathway data is available at a 5-year interval from 2020 to 2050, but the MIDAS model also requires future projections. Since the collected data is only for the most recent year, the data that is used directly in the model is treated as constant over the analysis or it is changed as a consequence of the implementation of a measure.

Data is also required to provide information on Sustainable Development Goals (SDGs) and Sustainable Energy and Climate Action Plans (SECAPs) at a regional level. Close cooperation with the partners involved in WP5 was undertaken to determine how each SDG Oriented Indicators (SOIs) should be calculated, which data is required, how to deal with unavailable data, etc. This led to a set of SOIs that target public administrations, businesses and citizens. For most of these SOIs, the collected data is directly used, as shown on Figure 1. Similar as for the MIDAS model, in some cases, the spatially disaggregated EUCalc pathway data is employed. The tools developed in the context of the project (Decarbonisation Profiler and Net-zero Business Consultant, WP8) will also directly or indirectly make use of the datasets.

The LOCALISED project requires data at a sufficiently high spatial resolution. It was anticipated from the start that a lot of data that is needed for analysis in the various parts of the project would not be available at the required level of detail, or may not even be available in some member states. The following issues were expected to occur:

- Missing data records: data in a spatial dataset is missing in some locations.
- Missing datasets: an entire dataset is unavailable for one or more member states.
- Insufficient spatial resolution: the spatial resolution of the dataset is insufficient for the required use.

[1]MIDAS (Modular and Integrated Decarbonization and Adaptation Solver) is a multidimensional optimization tool, designed to support EU member states during the climate transition on a regional scale. MIDAS assesses a diverse set of climate mitigation and adaptation measures in region-specific and multi-sector contexts to determine suitable climate response pathways. These aim to help European communities and policymakers develop and coordinate their sustainability and climate resilience efforts until the year 2050.

The disaggregation tool is an important part of WP3 to resolve these issues and its further development is ongoing (Task T3.1 - Extension and Improvement of the Disaggregation Tool). It will build on the results of Task T3.2 - Pan-European NUTS3-level Database for Disaggregation and Climate Change, which aims to investigate and partly resolve such data issues. T3.2 started with a discussion with other WPs in order to assess their data needs; work carried out in WP4 and WP5 defined the datasets that are important and at which spatial resolution this data is required. Consequently, Section 2 describes these different types of data and their purpose. As with any data gathering process, issues can be anticipated. The spatial aspect of the datasets introduces specific problems related to the definition of the spatial resolution and the availability of the data; these issues are considered in Section 3. The process workflow of the data collection process and data processing is described in Section 4. This includes the explanation on spatial disaggregation, but also the methodology to find proxy data useful for performing the spatial disaggregation. Section 5 provides a short overview of the collected datasets, both from EU databases as from local databases. Here we should add that the set of currently collected datasets is not final and may change when other tasks require other datasets. This may also require an additional reconsideration of proxy datasets. The data sharing platform and its API are provided in Section 6.

2 Data aspects

This section describes which data are needed, why they are needed and how the different types of data were collected. In order to avoid confusion, in this deliverable it is important to remember the difference between *input data and proxy data*. The term *input data* refers to data contained in datasets that are gathered in the context of the project. This includes data on a topic that is directly needed by other tasks in the project. The term *proxy data* refers to a subset of the input data that is not directly needed by other tasks but that helps to improve the datasets they need. Other tasks do not directly use the *proxy data*, but benefit from it through the improved data sets. However, it is possible for datasets to be direct input data for some parts of the LOCALISED research, while at the same time serve as proxy data for other datasets. One example of this is population is used in the calculation of some SOIs. In addition, it also is the default proxy dataset for disaggregation. It depends on the context whether such a data set is direct input data or proxy data.

The interaction between different WPs is described in the introduction. The data collection aims to support the tasks in these WPs. From a thematic point of view, the collected data can have different purposes, and we can distinguish four types:

1. Proxy data required to disaggregate EUCalc pathway data provided in WP2, of importance for WP4 and/or WP5.

2. Data directly required in WP4 and WP5. The aim is to find this data at a fine spatial resolution. However, this is not always available from public databases. In such a case, this data is collected at a coarse spatial resolution and spatially disaggregated in WP3.

3. Proxy data that is used to spatially disaggregate the data available only at coarse spatial resolution.

4. Additional data likely to be used for experimentation or verification purposes.

An important aspect of the data collection process is determining which datasets would be suitable to address any of these above themes. This was determined through interaction with researchers of other parts of the project to understand their data needs. Close cooperation with WP2 - Decarbonisation pathways at EU and MS-level and climate data - provided information on indicators relating to the pathways. T2.2 (Reproduction of decarbonisation pathways using the EUCalc model), and in particular D2.2 (Costa, 2022) provided a list of key sectoral indicators on activities, energy and emissions that are used in levers or ambition levels in the EUCalc model. An accurate knowledge of the current sectoral indicators is necessary as a starting point for the climate mitigation and adaptation pathways. Examples of key sectoral indicators from D2.2 are: CO_2 emissions in the industry sector [Mt], energy demand in households [kWh] or agricultural feed demand [kcal].

In the context of adaptation and mitigation, cities may want to prepare SECAPs and monitor SDGs. The evaluation of these is done by means of SOIs. A usable subset of the most relevant SOI for LOCALISED was determined in the context of WP5 (Task 5.1 SECAP definitions through oriented SDG indicators), and listed in deliverable D5.1 (Iralde et al, 2022). An example of a dataset that relates to these KPIs is "People at risk of income poverty after social transfers". In terms of data collection, the challenge is that many of these SOIs concern topics for which it is difficult to find suitable datasets, particularly at a fine spatial resolution. Where data is unavailable at the required spatial resolution, relevant proxy data is additionally collected. The required data is then spatially disaggregated using this proxy data. General examples of proxy data are spatial features, such as the rail network, population, power plants, gross value added in different economic sectors, etc. The format of such data - using geometries to represent the location and shape of real world features - differs from the format of remote sensing data. In the context of the project, this exact data and these geometries are less important; such datasets are processed to provide the attribute data for defined regions. A dataset containing the road network, for example, is thus processed to reflect the number of kilometres of road in the considered region. This processing allows us to treat all datasets in a similar way, which facilitates analysis and combination of different datasets.

3 Challenges and Solutions

The data collection process is an extensive process prone to a number of issues, many of which were indicated in the introduction. This section elaborates on the issues encountered and the determined solutions.

3.1 Varying region definitions

Many statistical data have a spatial dimension: population is an obvious example, but similarly GDP or other indicators can be associated with regions. Countries have their own administrative divisions at multiple levels. However, to facilitate comparison between regions and countries, the EU has developed the NUTS standard. NUTS stands for Nomenclature of Territorial Units for Statistics - the acronym stems from French: *Nomenclature des Unités Territoriales Statistiques* - and defines a hierarchy of three spatial subdivisions of the EU member states (Figure 2). This hierarchy starts from the country level (NUTS0); each higher numbered level progressively partitions the previous level into smaller regions, thus increasing spatial resolution. The NUTS regions are defined by Eurostat and, while they correspond as much as possible with administrative divisions, there are differences. For example, the NUTS2 partitioning of Poland follows the country's administrative division in 16 voivodeships, but it additionally subdivides the Mazowian voivodeship into two NUTS2 regions to yield 17 NUTS2 regions. Typically, the idea behind the NUTS hierarchy is that the NUTS regions relate to some extent to the spatial distribution of the population. This also means that the definition of the NUTS regions can change, and as such the definitions are revised approximately every four years. For the LOCALISED project, the NUTS definitions for the year 2016 are considered (NUTS - GISCO - Eurostat, 2021). The reason for this choice is that this NUTS definition became effective in 2018 and most data collected in the context of the project is available for this definition.

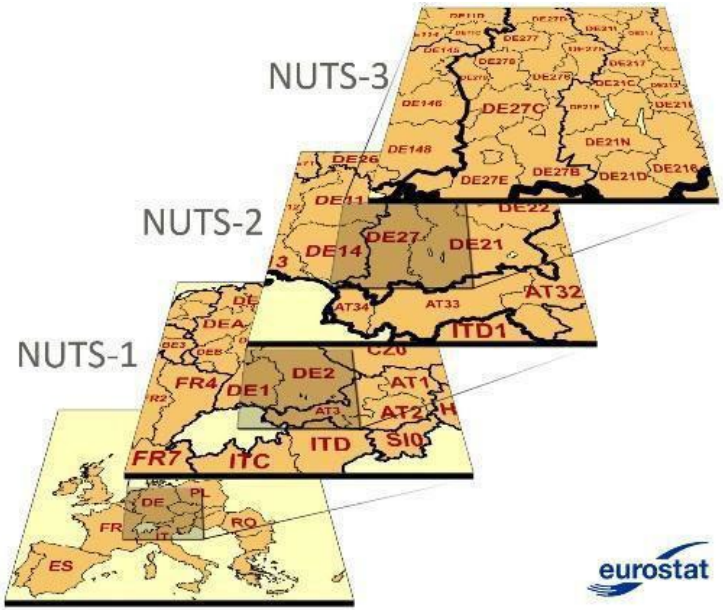

Figure 2: Illustration of NUTS levels (source: Eurostat).

Below the NUTS3 level sits the Local Administrative Unit (LAU) level. The definitions of these lower spatial divisions are more problematic and can theoretically change every year. To circumvent issues, only locational data (i.e., data with x and y coordinates) is collected by the LOCALISED project at this level. This helps us to easily adapt to changing region definitions. At present, the 2019 LAU definitions - which still hold for 2020 - are used (LAU - GISCO - Eurostat, 2021). Generally, data in the project is considered at LAU level. This is higher than the NUTS3 level required for LOCALISED, but as some data is available at such a high resolution, it was decided to not lose this level of detail, and consequently to consider all data internally at LAU level. In addition, the LAU level is also needed for the SECAPs. LOCALISED develops tools that should help local authorities with their SECAPs, e.g. the Decarbonisation Profiler. The upcoming LOCALISED Data Sharing Platform (DSP) will be capable of aggregating this data to any required spatial level upon data query. Furthermore, the data will be annotated with a quality rating at each of the spatial levels.

3.2 Missing data / datasets

LOCALISED is a very data-driven project, which needs data on various topics at a high spatial resolution for all EU member states. While the EU databases contain a vast amount of data, the combination of the high spatial resolution at which the data is required, and the spatial extent that covers all EU member states creates a situation in which it cannot be ensured that all necessary data will be available for all locations from the EU databases. There may be gaps of various sizes - from some NUTS3 regions to all regions in one or more member states. As such, a methodology to obtain reasonable

estimates for this data is required. There potentially exist local databases that could be used to fill the gaps, however access to local databases differs per country and often requires a proper interpretation of the data to match it with what is desired. Research led to a database for 3 EU countries, which provided an insight into the magnitude of these problems and into the issues with gathering data from local databases, benefiting from the ideal circumstance where the consortium partners have experience with the local databases. This is however not the case for all member states and resorting to local databases poses two major challenges: it is too cumbersome and there is no guarantee that the required data is present in the local databases. In essence, to streamline and automate the data processing by unifying the workflow for all member states, a method is developed to derive the missing data and only use the local country-databases as a means to verify the developed methodology.

From the missing data point of view, the EU is seen as an all-encompassing region: missing data at the level of a NUTS3 region is considered equivalent to missing data at the level of a member state - essentially, there would be a lot of missing data at NUTS3 level in the latter case. As such, the same approach for resolving the missing data can be used. At this stage, missing data is given the value 0 and is annotated as "bad" in terms of its quality rating. Future work will include a missing data imputation methodology and a better quality rating strategy.

The aim of the project is to provide coverage for EU member states, however, it was decided to omit the Canary Islands and overseas territories, as too much data for these regions are not available. These regions - due to their distance from the continental mainland, relatively small size and different climate conditions - play less of a role for policies and climate impacts for studies that focus on the mainland of the EU.

3.3 Low spatial resolution

LOCALISED aims to help regions and their local administrations and businesses understand what options they have to identify and mitigate the impacts of climate change or adapt to them. Here, "*local level"* is defined as "at NUTS3 level". To achieve this, a lot of data is required at NUTS3 level or better. This is challenging as some datasets are only available at lower resolutions such as regional (NUTS2 or NUTS1) or even at country level (NUTS0). Consequently, there is a need to increase the spatial resolution of the data through spatial disaggregation methods. Apart from data collection, WP3 is dedicated to investigating and developing spatial disaggregation methods. In a nutshell, these methods distribute the values that are known at e.g. a NUTS2 level over its contained NUTS3 regions, based on appropriate proxy data. By appropriate, we mean that the spatial distribution of the proxy data should resemble the spatial distribution of the dataset at hand. The concept of spatial disaggregation is depicted in Figure 3. Here, as an illustration, the emissions from the residential sector are disaggregated using population as a proxy.

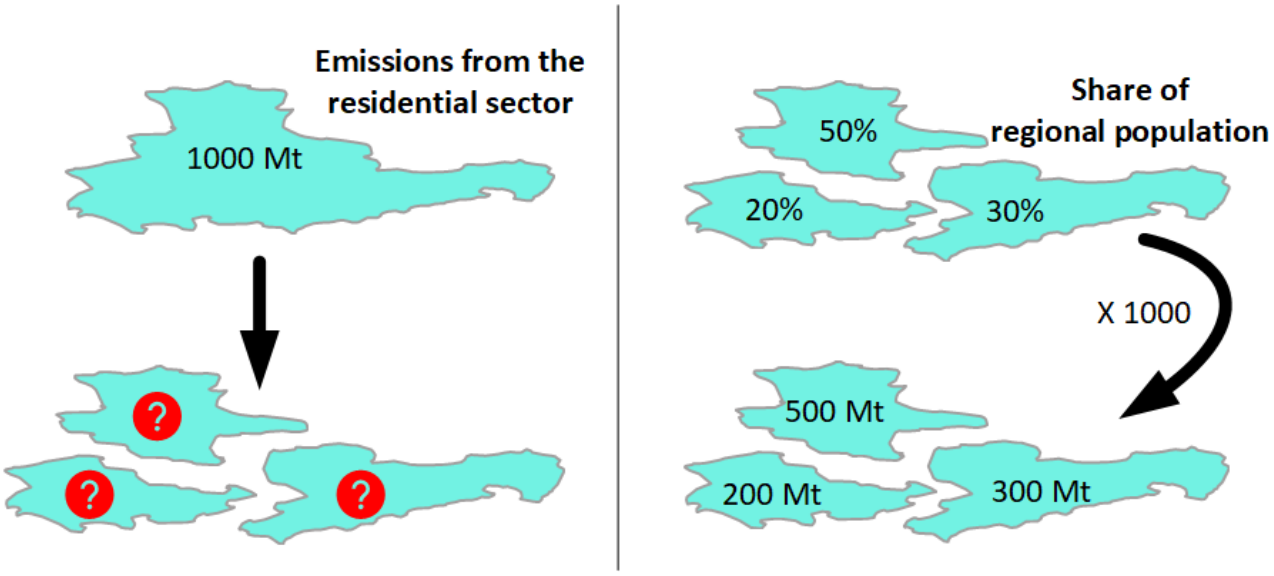

Figure 3: Depiction of the concept of spatial disaggregation using an example of emissions from the residential sector.

Spatial disaggregation is a non-trivial problem which requires additional knowledge on the spatial distribution of the data. Depending on the data to be disaggregated, different proxy datasets are required. The selection of proxy data, its evaluation and its use are further elaborated in the following Section 4.

The main idea behind spatial disaggregation in this deliverable is through the use of proxy data. The reason for using proxy data is that - for the datasets needed - it is usually possible to find a dataset that provides insights in the underlying spatial distribution of the data to be disaggregated.

3.4 User uploaded datasets

End users of the tools developed in LOCALISED will be able to upload their own data. This data is however not incorporated in the databases, but will be stored in the back-end and will only be available for the user that uploaded the data. The main reason for this is that it avoids the issue of having to verify if the data is accurate (either through checking of the data, or through some trust-level of the users), which facilitates maintaining the correctness of the database and the consistency for other users while also allowing the users to upload their own better data or even fictional data for whatever purpose they see fit.

4 Process Workflow

The main focus of WP3 is data provision for other WPs in the project. Several tasks are undertaken in order to provide the data of good quality, at LAU level and for all the EU member states.

These tasks start from data collection and simple disaggregation using population data, to then further refine the process by analysing the data and manually assigning more suitable proxy data. The process of using proxy data will be further refined using machine learning methods, leading up to the disaggregation of the data with final proxies is expected by September 2024 as a part of D3.4 (Data Sharing Platform Final Version). Each task is elaborated on in the following subsections.

4.1 Data collection

The data collection began with collection of data requirements in regard to measures for cross-sectoral mitigation and adaptation and dynamic data and knowledge to implement and monitor local decarbonisation plans. Once we had an initial set of data requirements, we tapped into the public databases such as Eurostat to collect, process and assess the quality of the data. An overview of the different data sources is provided in Section 5. The data collection has been a continuous process as the data requirements get updated or more public databases are accessed. The collected data for three EU member states was showcased in the confidential deliverable, D3.2 in Month 18 (March 2023).

4.2 Disaggregation with population as proxy

Although the LOCALISED project aims to provide data, and subsequent analysis, at NUTS3 level, we provide all the data at LAU level. Since most data collected was not directly available at LAU level or NUTS3 level for that matter, we had to spatially disaggregate the data. In addition, the EUCalc pathway data needs to be disaggregated from country level to LAU level.

Once a sufficient set of data was collected, datasets that were required for other research activities in LOCALISED and were available at LAU level were directly passed on. For other collected datasets and also the EUCalc pathway data, we performed spatial disaggregation using population as proxy very early on in the project. The aim was to:

1. demonstrate feasibility and evaluate software stack
2. provide a full dataset of preliminary data as input to the MIDAS model

4.3 Data analysis

The next step was to analyse the data to evaluate its quality and identify potential proxies for each variable that required disaggregation. A correlation analysis was performed to understand which variables correlate the most with other variables. Here, Pearson correlation was used, considering the regions in the dataset as elements. The Pearson Correlation r_{xy} is defined as:

$$r_{xy} = \frac{\sum_{i=1}^{n} (x_i - \underline{x})(y_i - \underline{y})}{\sqrt{\sum_{i=1}^{n} (x_i - \underline{x})^2} \sqrt{\sum_{i=1}^{n} (y_i - \underline{y})^2}}$$

where x_i, y_i are the indexed the sample points of two populations of size n and $\underline{x}$ the notation for the average ($\underline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$). This formula returns values from the interval [-1,+1], with a value closer to +1 indicative for a strong correlation, a value of 0 indicating no correlation and a value close to -1 matching with an inverse correlation.

Several factors play a part in correctly applying and interpreting the Pearson correlation. Important for a proper assessment is that the sample size i.e. the number of regions is large enough: the NUTS2 level in Poland for example only has 17 regions, which is quite a small sample size to gain a reliable correlation assessment - Germany by contrast has 38 regions at NUTS2 level. At NUTS3, Poland has 73 regions while Germany has 401. A small dataset has the problem that a single region can quickly offset the calculation, and there are not enough other data points to compensate for this. Consequently, care has to be taken that data sets involved in the calculation are sufficiently large. This problem goes beyond the number of regions and is particularly an issue when the modelled data concerns a property that is not common. Poland for example has 3 hydro-power plants, so finding a variable that correlates well with hydro-power would require the support of an expert as sample size is just too small.

The Pearson correlation value informs about correlation, but provides no insights in causality, i.e. which dataset is implied by which dataset: do people move to places where there is industry (e.g. to work) or do industrial regions develop where people live? As we merely are looking for correlation, this direction is of less importance for our purpose, although it is important to be sure that the correlation uncovered using the data from one country is not due to pure coincidence or due to local aspects as this may not be representative for other countries. As such, expert knowledge and understanding of the datasets is needed to identify suitable proxy data.

After calculating correlations between multiple datasets, the results can be visualised on a correlation map. This is a matrix or table with the involved variables both in rows and in columns. Each entry contains the value of the Pearson correlation and it is obvious that a set correlates to a degree 1 with itself. The fields are also colour-coded to increase the visibility. When we look at the correlation map of all the variables belonging to a particular sector, say transport (see Figure 4), one expects the variables to be highly correlated. For example, where there is high rail and road network cover, one expects a high number of vehicles. If this is not the case, one reason could be that the data quality is poor. Furthermore, the variables that exhibit high correlations could be good proxies for the disaggregation of other variables related to the transport sector.

The correlation map of the variables belonging to the transport sector, at NUTS2 level or lower, with no missing values is shown in Figure 4. It can be seen that employment in the transport sector, vehicle stock and fuel and charging stations exhibit high correlation. On the other hand, railway lengths with different power sources exhibit low correlation.

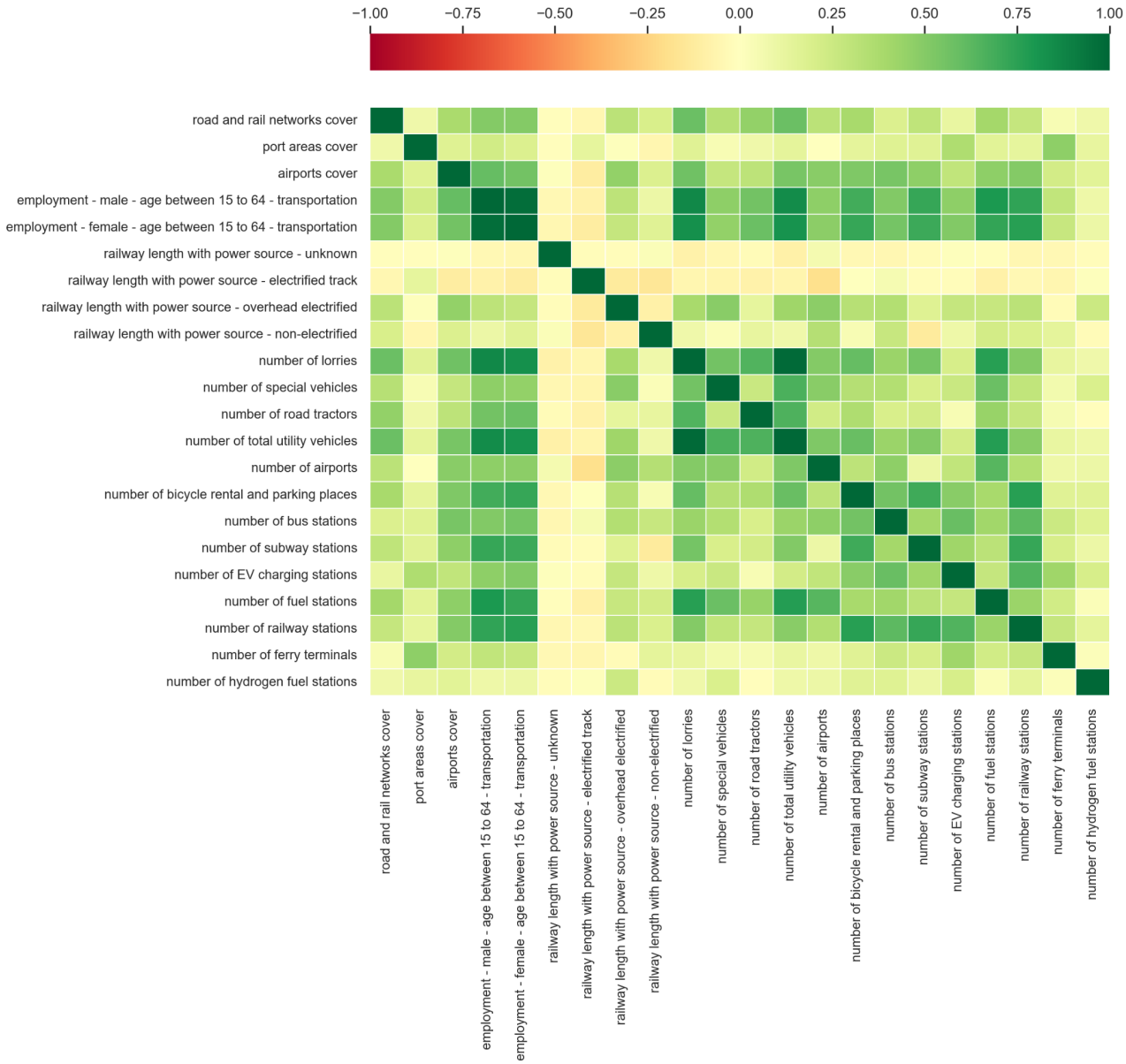

Figure 4. Correlation map of all the variables belonging to the transport sector, at NUTS2 level or lower

4.4 Manual assignment of individual proxies

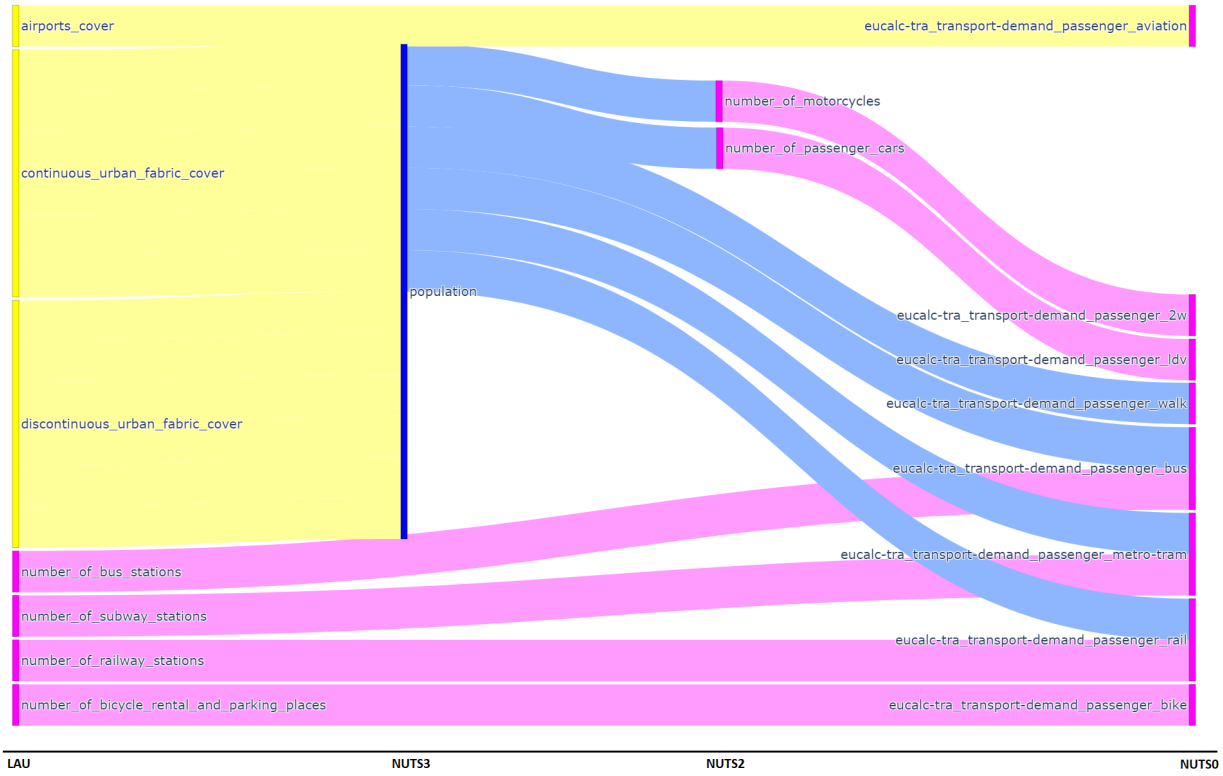

Figure 5: Sankey diagram showing the proxies assigned to EUCalc variables related to passenger transport demand of different vehicle types. NOTE: the size of the nodes and links is not relevant in the interpretation of the diagram.

Based on the knowledge gained from correlation analysis, we assigned proxies to each variable manually. A small subset of this work is showcased with the help of a sankey diagram in Figure 5. The figure shows the EUCalc pathway variables related to passenger transport demand of different vehicle types (the size of the nodes and links in the sankey diagram are not relevant to the interpretation). These variables were required for cross-sectoral mitigation and adaptation as well as for decarbonisation plans. The proxy reasoning is as follows:

1. **eucalc-tra_transport-demand_passenger_2W:** This variable gives the transport demand of 2-wheelers at NUTS0 level. It is disaggregated using the number of motorcycles. This data is available from Eurostat at NUTS2 level. Therefore, we first have to disaggregate the number of motorcycles. We disaggregated the variable based on population data, which is available at NUTS3 level in Eurostat. Since our goal is to provide data at LAU level, we had to further disaggregate population data. Here, we use the sum of continuous and discontinuous urban fabric covers as a proxy. This data is available from Corine Land Cover.

2. **eucalc-tra_transport-demand_passenger_LDV:** LDV stands for light duty vehicles, such as passenger cars. Here, a similar approach as above is used. The only difference is that the number of passenger cars is used instead of the number of motorcycles. This variable is also available at NUTS2 level from Eurostat.

3. **eucalc-tra_transport-demand_passenger_aviation:** This variable is disaggregated based on the airports cover data from Corine Land Cover. This is preferred to the number of airports because the size of the airport might provide a better indication regarding the passenger traffic in these airports.

4. **Eucalc-tra_transport-demand_passenger_bus:** This variable is disaggregated using a sum of the number of bus stations and population as a proxy. The number of bus stations is available at LAU level from OpenStreetMap.

5. **eucalc-tra_transport-demand_passenger_metro-tram:** This variable is disaggregated using a sum of the number of subway stations and population as a proxy. The number of subway stations is also available at LAU level from OpenStreetMap.

6. **eucalc-tra_transport-demand_passenger_rail:** This variable is disaggregated using a sum of the number of railway stations and population as a proxy. The number of railway stations is also available at LAU level from OpenStreetMap.

7. **eucalc-tra_transport-demand_passenger_bike:** This variable is disaggregated based on the number of bicycle rental and parking places, also available at LAU level from OpenStreetMap.

8. **eucalc-tra_transport-demand_passenger_walk:** This variable is disaggregated based on population.

Although the correlation analysis aided us in the proxy assignment, the work has mostly been manual, as is evident from the proxy reasoning above. During the proxy assignment, we determined further data requirements. The required datasets were searched for and, where available, collected and used as proxies.

The disaggregated data was made available to the consortium via the Data Sharing Platform (DSP) in September, 2023. The DSP is described in Section 6.

4.6 Upcoming steps: Proxy refinement

The next activity in regard to the datasets will be to refine the proxies. Based on the work so far, several next steps are planned. Some light is shed on each of these steps in the following subsections.

4.6.1 Continue correlation analysis

Some new datasets were collected during the manual proxy assignment stage. A correlation analysis including these variables will be performed. In Figure 4 already some clusters are visible: the number of lorries, special vehicles, road tractors and total utility vehicles all correlate rather closely. Such patterns or knowledge may provide interesting insights to determine suitable proxy variables. Further conclusions will be drawn that can be useful in the proxy refinement.

4.6.2 A multi-step spatial disaggregation approach

As mentioned before, the data is collected at various spatial levels. The number of regions per spatial level is given in Table 1. The number of regions also define the sample size for data analysis such as correlation. We considered NUTS2 in our correlation analysis because 232 regions make up a good sample size (Section 4.3). Since correlation requires all the data to have the same sample size, the data present at NUTS3 and LAU levels was aggregated to NUTS2 level.

Table 1: Number of regions per spatial level

Spatial level	Number of regions/Sample size
NUTS0	27
NUTS1	88
NUTS2	232
NUTS3	1155
LAU	95314

Similarly to correlation analysis, we plan to implement machine learning algorithms such as Random Forest (Breiman, 2001) to determine the relationships between a variable to be disaggregated from NUTS2 level and the potential proxies present at NUTS3 and LAU levels.

Owing to small sample size at NUTS0 and NUTS1 levels, a semi-manual proxy assignment from NUTS0 to NUTS2 is required. This will be based on correlations, literature and also expert knowledge from the consortium members.

The resulting algorithm will be packaged into a Working Disaggregation Tool that is planned to be released in March 2024.

4.6.3 Missing value imputation

There are many variables that are missing values in some regions. Spatial disaggregation requires proxy data to be complete. The relative share of the proxy in each region determines the distribution of the value to the regions. If a region is missing data, it affects all the regions during spatial disaggregation.

Therefore, it is crucial that the missing values are imputed or filled. Different missing value imputation algorithms, such as XGBoost (Chen and Guestrin, 2016), will be evaluated.

5 Collected datasets

An overview of the non-climate related data sources from which data was collected is provided in the appendix at the end of this deliverable. We distinguish between EU data sources, which should provide similar data for all member states and country-specific data sources (for Germany and Poland) as sources for learning about potential proxy data and for gathering datasets for verification purposes.

5.1 Common data sources for all member states

Copernicus Land Monitoring Service - Corine Land Cover

Copernicus is the European Union' Earth Observation program (Corine Land Cover, 2018). It provides free and openly available data on six thematic services: land, marine, atmosphere, climate change, emergency management and security. Of interest in the context of LOCALISED is the information on land cover and land use. This data is available at 100m resolution. To make the conversion from the grid at 100m resolution to statistical spatial units, it is overlapped with LAU regions to obtain the values per LAU region - these can then be aggregated into NUTS regions as required. We collected 45 datasets, each containing 95,314 values (matching with LAU regions). For the raster datasets, no missing data was observed. Some datasets, e.g. the land use datasets, were provided in vector format and remapped to LAU regions. In this case, we have no automatic way of verifying the completeness of the source dataset as the mapping to LAU data is complete. As there is no reason to doubt the completeness, but also no knowledge on where data may be missing, the dataset is tagged as complete.

EUCalc Transport module

The information such as vehicle occupancy, utilisation rate, etc. is collected from the Transport module of the EUCalc project (Taylor et al, 2019). This data is not a part of the national decarbonisation pathways. Therefore, it was collected separately. A total of 69 datasets at NUTS0 level were collected; no dataset suffers from missing data.

ESPON Database Portal

The ESPON Database Portal provides harmonised and accurate data on the European territory and neighbouring countries (ESPON Database Portal, 2017). It gathers international statistics from ESPON projects as well as other databases. The ESPON Database Portal was employed as a source for information on quality of life index, vulnerability, susceptibility and coping capacity with regards to natural hazards at NUTS3 level. For the project, 6 datasets from ESPON were collected; no values were missing in any of the datasets. Each contains 1,155 values, matching with the NUTS3 regions.

Euro Regional Map, Eurogeographics

The rail network length information is collected from this source (Open Maps for Europe - Eurogeographics, 2022). The four collected datasets are all complete and provide data at LAU level.

European Environment Agency

The European Environment Agency collects and provides access to various environmental statistics (https://discomap.eea.europa.eu). The LOCALISED project sourced 4 datasets (1 on life lost due to air pollution, 3 on air pollution), which all are at NUTS0 level and complete over the EU.

Eurostat

Eurostat is the statistical office of the European Union, whose mission is to provide high-quality statistics and data on Europe (Database - Eurostat, 2022). In the context of LOCALISED, the Eurostat database was the source for regional statistics relating to e.g. population, area, GDP, GVA, etc. The data is available at NUTS3 or lower resolution. A total of 380 datasets were sourced from Eurostat, Table 2 gives an overview of spatial resolutions and the amount of missing data.

Table 2: Statistics on Eurostat data

Spatial level	Number of datasets	Number of sets with missing data
NUTS0	226	7
NUTS2	49	29
NUTS3	100	34
LAU	5	5

Joint Research Centre

The Joint Research Centre (JRC) is the European Commission's science service. It employs scientists to carry out research to provide independent scientific advice and support to policies of the European Union. It provides collections of open datasets for various scientific disciplines. In the context of the LOCALISED project, the JRC resource (JRC Data Catalogue, 2022) was used to obtain information on number of and generation capacity of different types of power plants and transport fuel intensity. The project collected a total of 38 datasets at LAU level; in none of them was the issue of missing data.

The JRC also provides data from the Covenant of Mayors (Lo Vullo et al, 2020); 11 datasets on emission factors were collected. All these datasets are at NUTS0 and do not have missing values.

OpenStreetMap

OpenStreetMap is an organisation that aims to collect and provide open, spatial data with global coverage. In the context of LOCALISED, 8 datasets on traffic infrastructure were collected; they were sourced from https://planet.osm.org. These are provided as vectoral data and remapped to LAU regions. As a result, all LAU have data but it is not possible to verify if the source data is complete.

Our World In Data

Our World In Data provides many datasets on various statistics; in the context of LOCALISED 4 datasets on health/mortality were collected (Ritchie et al, 2018), two from (Ritchie and Roser, 2021) and (Ritchie et al, 2022); they cover the entire EU and have complete data at NUTS0.

SEEnergies Open Data

SEEnergies is a European Horizon 2020 project which aims to provide answers to various energy-related scenarios (sEEnergies Open Data, 2022). Energy related information such as energy intensive industries and heat demand data were collected from this source. The source was used for 18 datasets; these datasets are at LAU resolution but also geolocated from other datasets. The same remark as for the Corine Land Cover holds, and no set is tagged as suffering from missing data.

World Bank

The World Bank (https://www.worldbank.org) provides global statistics for various sectors. Two datasets were sourced (gini index and the access to electricity), which are complete and at NUTS0 level.

A global inventory of solar photovoltaic generating units - dataset

The data relating to existing utility-scale photovoltaic capacity and area is collected from the global inventory of solar photovoltaic generation units (Kruitwagen et al, 2021a). The datasets are made available on Zenodo (Kruitwagen et al, 2021b) and are extracted per LAU region. Both datasets are complete and do not have missing data.

Other sources

The European Institute for Gender Equality (https://eige.europa.eu) provides statistics at country level (NUTS0) regarding gender equality. This dataset is complete when considered for the member states.

The estimated heat demand for residential and non-residential buildings was sourced from (Mueller and Fallahnejad, 2020) and (Mueller, 2020) respectively. These datasets are estimates provided as a heatmap at LAU level, in which no missing data is assumed.

Active citizenship is sourced from (Annoni and Bolsi, 2020), this NUTS2 level dataset has approx. 2.16% of values missing.

The number of hydrogen fuel stations was obtained from https://h2-map.eu/ , and is a complete dataset at LUA level.

5.2 Data outside of the EU databases

Apart from the EU databases, data is sourced from local databases for the purpose of helping with the identification of proxy data, but also for the verification of the spatial disaggregation algorithm. This data - even though it is not input data as such - was also

added to the LOCALISED Data Sharing Platform. The main goal of this data is to learn more on the spatial correlations between datasets. This knowledge in turn provides more insights in potential proxy data, which can be applied in situations when data is missing for some of the member states in the EU datasets, but proxy datasets have been identified and are present. This section contains a subset of the available datasets and sources; of importance here is the gained knowledge in accessing these local datasets, should the need for this information arise.

Builda - building database

This is an on-going project at the Forschungszentrum Jülich. The project focuses on the provision of building-related stats such as the number of buildings, energy consumption, rooftop PV potentials, etc. At the moment, the data is available for Germany. However, it is planned to be extended to other EU countries. Builda is used to collect 17 datasets, covering Germany at LAU level resolution. None of the datasets is incomplete.

Regionaldatenbank - Germany

The German Regionaldatenbank (https://www.regionalstatistik.de) was used as the source for various statistics (waste, buildings, agriculture, etc.) for Germany. In total 64 collected datasets are all at NUTS3 level, almost all suffering from at least some missing data.

Statistics Poland - Local Data Bank

GUS, the national statistics office (Główny Urząd Statystyczny) maintains an openly accessible database of various national and regional statistics. Depending on the datasets, data are made available for many years and in different spatial resolutions, either administrative subdivisions or NUTS levels. The local database (BDL, Bank Danych Lokalnych) was used for regional statistics such as residential building stock, vehicle stock, etc. (GUS-BDL, 2022). In total, 58 datasets were collected from BDL; all are at NUTS3 level and do not suffer from missing data.

Tool for Renewable Energy Potentials - Database

The wind turbine and photovoltaic potentials for Germany are collected from the tool for renewable energy potentials (Risch et al, 2022). This source provided three datasets, covering Germany, all complete and at LAU level.

6 Data Sharing Platform

6.1 Application Programming Interface

The LOCALISED Data Sharing Platform (DSP) is an Application Programming Interface (API) that provides access to the databases. The format of the API URL is described below. The URL can be constructed with the desired set of parameters and pasted in any web browser to access the corresponding data.

API URL Format: http://data.localised-project.eu/api/v1/region_data/?api_key=api_key&resolution=resolution&country=country&region=region

The parts highlighted in red are the parameters. These are described in Table 3.

Table 3: API parameters

Parameter	Description	Options
api_key	The confidential API key.	(expected to be made public in September 2024)
resolution	The spatial resolution at which the data should be queried. Here, the data at higher levels is an aggregation of data at lower levels.	NUTS0, NUTS1, NUTS2, NUTS3, LAU
country	The country code corresponding to the country for which the data is to be queried.	DE, PL, ES, …
region	The region code corresponding to the country's region for which the data is to be queried.	Any region code. Note: a list of regions, corresponding to the specified resolution and country can be queried in the following manner: http://data.localised-project.eu/region_metadata/?api_key=api_key&resolution=resolution&country=country

Example of an API query:

In order to explain how the API will work, we provide one example: suppose the query is to be made for Berlin in Germany. First, the spatial resolution and region code are to be determined. Berlin is at LAU level; therefore, LAU is specified as the resolution. The region code of Berlin is 11000000 and as such the region would be 11000000. Lastly,

Berlin is in Germany so the country code is DE. The API URL, in this case, would be (the api key is not shown):

http://data.localised-project.eu/api/v1/region_data/?api_key=XXXXXXJ&resolution=LAU&country=DE&region=11000000

The result would look as follows:

HTTP 200 OK

Allow: GET

Content-Type: application/json

Vary: Accept

{

"count": 17122,

"next":"http://data.localised-project.eu/api/v1/region_data/?api_key=XXXXXX&country=DE&page=2&region=11000000&resolution=LAU",

"previous": null,

"results": [

{

"value": 1087863.0,

"year": 2020.0,

"confidence_interval": null,

"quality_rating": "good",

"var_name": "population",

"var_description": null,

"var_unit": "number",

"var_aggregation_method": "sum",

"pathway_main": null,

"pathway_reference": null,

"pathway_variant": null,

"data_source_name": "Eurostat",

"data_source_link": "https://dummy_link.com",

"data_source_citation": "Eurostat, 2022.",

"original_resolution": "NUTS3",

"climate_experiment": null,

"disaggregation_method": "Using proxy metrics",

"tags": {

```
        "sector": [
            "general stat"
        ],
        "type": [
            "not applicable"
        ],
        "commodity": [
            "not applicable"
        ],
        "resource": [
            "not applicable"
        ],
        "link": [
            "not applicable"
        ],
        "objective": [
            "not applicable"
        ],
        "direction": [
            "not applicable"
        ],
        "other": [
            "not applicable"
        ]
    },
    "proxy_metrics": [
     "number of pixels with continuous urban fabric",
     "number of pixels with discontinuous urban fabric"
    ] } ] }]
```


Please note that only one variable is shown in the above example result. This variable is the population. The actual query provides all the data collected and curated for the region. Table 4 describes the variable fields:

Table 4: Variable fields in the API query output

Field	Description
value	The value of the variable.
year	The year for which the data is collected.
confidence_interval	The field is specific to data that is disaggregated in WP3. This provides an indication regarding the level of confidence with which the variable is disaggregated. This is a work-in-progress. Therefore, the values currently are all null.
quality_rating	Specifies the quality of the data. Currently, it is "good", if the value was originally present and "bad" is the value was missing and therefore, it was filled as 0 during data collection. This will improve in the future.
var_name	Name of the variable.
var_description	A detailed description of the variable is provided, where required. It is left blank, otherwise.
var_unit	The unit in which the value is expressed.
var_aggregation_method	When the data is queried at higher level, the data from lower level is aggregated. The type of aggregation performed is indicated here. This could for example be sum or mean.
pathway_main, pathway_reference, pathway_variant	These fields are specific to EUCalc national decarbonisation pathway variables that are downscaled here to local regions. They describe various pathways.
data_source_name, data_source_link, data_source_citation	The information regarding data source is specified here.
original_resolution	The resolution at which the data was available and therefore, collected is specified here.
climate_experiment	This field is specific to climate indicators. They describe which climate scenario or the Representative Concentration Pathway (RCP) considered to arrive at the climate projections.
disaggregation_method	This field specifies the disaggregation method used to downscale the values from its original resolution to LAU resolution.
tags	This is a list of keywords that helps describe and categorise the variable further.
proxy_metrics	The list of variables used as a proxy to disaggregate data is specified here. This is left empty if no proxy data was used.

API documentation:

Further information regarding the API can be found in the official documentation under: http://data.localised-project.eu/api/v1/docs/

6.2 API Client

An API client provides ready-to-run scripts that allow one to query the API data with minimal effort. These scripts not only allow the user to query the data, but also to save it in a desired format, such as .csv or .json, in their local machine. Such an API client is developed for the API and is currently hosted on GitHub. This can be found under: https://github.com/FZJ-IEK3-VSA/LOCALISED-Datasharing-API-Client.

This client includes functions written in the Python language that allow users to make queries and save the regional data. This helps avoid querying the data each time. The usage of these functions is described through an example script. This can be found in a Jupyter Notebook under: https://github.com/FZJ-IEK3-VSA/LOCALISED-Datasharing-API-Client/blob/master/examples/single_region_all_variables.ipynb

7 Conclusion

This report presents the current status of the data gathering in the LOCALISED project and describes the relevant data sourced from European databases for direct use in other parts of the LOCALISED research, as well as the data sourced from both European and local databases (Germany and Poland) with the purpose of supporting a spatial disaggregation in order to meet the requirements regarding the spatial resolution of the data. As the aim of LOCALISED is to provide local information, the disaggregation described in this report is a necessary tool to achieve this. The spatial disaggregation is performed by means of proxy data, which requires the need for additional datasets. The local datasets collected in this context serve for the verification of the methodology.

The relevant data for 2020, as presented in this report, provides the foundation for disaggregating the future pathways as obtained from EUCalc. In order to disaggregate these pathways, additional datasets are needed to complete the process; the appendix gives an overview of all the collected datasets.

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Appendix

This appendix provides a full list of the collected datasets (including the climate related datasets that are referred to in the report on the Climate change database and other spatial data (D2.5, expected September 2023), with the spatial level, the number of regions that are contained in the dataset and statistics on the number or regions for which data are missing.

Variable name	Spatial level	Total number of regions	Number of regions missing data	% missing data
annual mean precipitation	NUTS3	1155	0	0
annual total precipitation	NUTS3	1155	0	0
annual mean mean temperature	NUTS3	1155	0	0
annual mean maximum temperature	NUTS3	1155	0	0
annual mean minimum temperature	NUTS3	1155	0	0
annual mean temperature cooling degree days	NUTS3	1155	0	0
annual maximum temperature cooling degree days	NUTS3	1155	0	0
annual minimum temperature cooling degree days	NUTS3	1155	0	0
annual mean temperature heating degree days	NUTS3	1155	0	0
annual maximum temperature heating degree days	NUTS3	1155	0	0
annual minimum temperature heating degree days	NUTS3	1155	0	0
historical probability of coldwaves - maximum	NUTS3	1155	0	0

historical probability of coldwaves - mean	NUTS3	1155	0	0
historical probability of heatwaves - maximum	NUTS3	1155	0	0
historical probability of heatwaves - mean	NUTS3	1155	0	0
historical probability of very high fire-risk - maximum	NUTS3	1155	0	0
historical probability of very high fire-risk - mean	NUTS3	1155	0	0
historical probability of high fire-risk - maximum	NUTS3	1155	0	0
historical probability of high fire-risk - mean	NUTS3	1155	0	0
historical probability of moderate fire-risk - maximum	NUTS3	1155	0	0
historical probability of moderate fire-risk - mean	NUTS3	1155	0	0
historical probability of heavy precipitation - maximum	NUTS3	1155	0	0
historical probability of heavy precipitation - mean	NUTS3	1155	0	0
change in frequency of coldwaves - maximum	NUTS3	1155	0	0
change in frequency of coldwaves - mean	NUTS3	1155	0	0
change in frequency of heatwaves - maximum	NUTS3	1155	0	0
change in frequency of heatwaves - mean	NUTS3	1155	0	0
change in frequency of very high fire-risk - maximum	NUTS3	1155	0	0
change in frequency of very high fire-risk - mean	NUTS3	1155	0	0
change in frequency of high fire-risk - maximum	NUTS3	1155	0	0

change in frequency of high fire-risk - mean	NUTS3	1155	0	0
change in frequency of moderate fire-risk - maximum	NUTS3	1155	0	0
change in frequency of moderate fire-risk - mean	NUTS3	1155	0	0
change in frequency of heavy precipitation - maximum	NUTS3	1155	0	0
change in frequency of heavy precipitation - mean	NUTS3	1155	0	0
change in intensity of coldwaves - maximum	NUTS3	1155	0	0
change in intensity of coldwaves - mean	NUTS3	1155	0	0
change in intensity of heatwaves - maximum	NUTS3	1155	0	0
change in intensity of heatwaves - mean	NUTS3	1155	0	0
change in intensity of very high fire-risk - maximum	NUTS3	1155	0	0
change in intensity of very high fire-risk - mean	NUTS3	1155	0	0
change in intensity of high fire-risk - maximum	NUTS3	1155	0	0
change in intensity of high fire-risk - mean	NUTS3	1155	0	0
change in intensity of moderate fire-risk - maximum	NUTS3	1155	0	0
change in intensity of moderate fire-risk - mean	NUTS3	1155	0	0
change in intensity of heavy precipitation - r20 - maximum	NUTS3	1155	0	0
change in intensity of heavy precipitation - r20 - mean	NUTS3	1155	0	0
time frame of coldwaves - maximum	NUTS3	1155	0	0

time frame of coldwaves - mean	NUTS3	1155	0	0
time frame of heatwaves - maximum	NUTS3	1155	0	0
time frame of heatwaves - mean	NUTS3	1155	0	0
time frame of very high fire-risk - maximum	NUTS3	1155	0	0
time frame of very high fire-risk - mean	NUTS3	1155	0	0
time frame of high fire-risk - maximum	NUTS3	1155	0	0
time frame of high fire-risk - mean	NUTS3	1155	0	0
time frame of moderate fire-risk - maximum	NUTS3	1155	0	0
time frame of moderate fire-risk - mean	NUTS3	1155	0	0
time frame of heavy precipitation - maximum	NUTS3	1155	0	0
time frame of heavy precipitation - mean	NUTS3	1155	0	0
continuous urban fabric cover	LAU	95314	0	0
discontinuous urban fabric cover	LAU	95314	0	0
industrial or commercial units cover	LAU	95314	0	0
road and rail networks cover	LAU	95314	0	0
port areas cover	LAU	95314	0	0
airports cover	LAU	95314	0	0
mineral extraction sites cover	LAU	95314	0	0

dump sites cover	LAU	95314	0	0
construction sites cover	LAU	95314	0	0
green urban areas cover	LAU	95314	0	0
sport and leisure facilities cover	LAU	95314	0	0
non-irrigated arable land cover	LAU	95314	0	0
permanently irrigated land cover	LAU	95314	0	0
rice fields cover	LAU	95314	0	0
vineyards cover	LAU	95314	0	0
fruit trees and berry plantations cover	LAU	95314	0	0
olive groves cover	LAU	95314	0	0
pastures cover	LAU	95314	0	0
permanent crops cover	LAU	95314	0	0
complex cultivation patterns cover	LAU	95314	0	0
agriculture with natural vegetation cover	LAU	95314	0	0
agro-forestry areas cover	LAU	95314	0	0
broad-leaved forest cover	LAU	95314	0	0
coniferous forest cover	LAU	95314	0	0
mixed forest cover	LAU	95314	0	0

natural grasslands cover	LAU	95314	0	0
moors and heathland cover	LAU	95314	0	0
sclerophyllous vegetation cover	LAU	95314	0	0
transitional woodland-shrub cover	LAU	95314	0	0
beaches and dunes and sand cover	LAU	95314	0	0
bare rocks cover	LAU	95314	0	0
sparsely vegetated areas cover	LAU	95314	0	0
burnt areas cover	LAU	95314	0	0
glaciers and perpetual snow cover	LAU	95314	0	0
inland marshes cover	LAU	95314	0	0
peat bogs cover	LAU	95314	0	0
salt marshes cover	LAU	95314	0	0
salines cover	LAU	95314	0	0
intertidal flats cover	LAU	95314	0	0
water courses cover	LAU	95314	0	0
water bodies cover	LAU	95314	0	0
coastal lagoons cover	LAU	95314	0	0
estuaries cover	LAU	95314	0	0

sea and ocean cover	LAU	95314	0	0
land use - no data cover	LAU	95314	0	0
traffic area - total - Germany	NUTS3	401	1	0.25
traffic area - road - Germany	NUTS3	401	1	0.25
traffic area - side-strip and water ditch - Germany	NUTS3	401	1	0.25
traffic area - other - Germany	NUTS3	401	1	0.25
traffic area - railway - Germany	NUTS3	401	1	0.25
traffic area - airport - Germany	NUTS3	401	44	10.97
traffic area - ship - Germany	NUTS3	401	187	46.63
population	NUTS3	1155	0	0
population - age less than 5	NUTS3	1155	0	0
population - age between 5 and 9	NUTS3	1155	0	0
population - age between 10 and 14	NUTS3	1155	0	0
population - age between 15 and 19	NUTS3	1155	0	0
population - age between 20 and 24	NUTS3	1155	0	0
population - age between 25 and 29	NUTS3	1155	0	0
population - age between 30 and 34	NUTS3	1155	0	0

population - age between 35 and 39	NUTS3	1155	0	0
population - age between 40 and 44	NUTS3	1155	0	0
population - age between 45 and 49	NUTS3	1155	0	0
population - age between 50 and 54	NUTS3	1155	0	0
population - age between 55 and 59	NUTS3	1155	0	0
population - age between 60 and 64	NUTS3	1155	0	0
population - age between 65 and 69	NUTS3	1155	0	0
population - age between 70 and 74	NUTS3	1155	0	0
population - age between 75 and 79	NUTS3	1155	0	0
population - age between 80 and 84	NUTS3	1155	0	0
population - age between 85 and 89	NUTS3	1155	0	0
population - age greater than or equal to 90	NUTS3	1155	0	0
population - age unknown	NUTS3	1155	0	0
population - female	NUTS3	1155	0	0
population - female - age less than 5	NUTS3	1155	0	0
population - female - age between 5 and 9	NUTS3	1155	0	0
population - female - age between 10 and 14	NUTS3	1155	0	0
population - female - age between 15 and 19	NUTS3	1155	0	0

population - female - age between 20 and 24	NUTS3	1155	0	0
population - female - age between 25 and 29	NUTS3	1155	0	0
population - female - age between 30 and 34	NUTS3	1155	0	0
population - female - age between 35 and 39	NUTS3	1155	0	0
population - female - age between 40 and 44	NUTS3	1155	0	0
population - female - age between 45 and 49	NUTS3	1155	0	0
population - female - age between 50 and 54	NUTS3	1155	0	0
population - female - age between 55 and 59	NUTS3	1155	0	0
population - female - age between 60 and 64	NUTS3	1155	0	0
population - female - age between 65 and 69	NUTS3	1155	0	0
population - female - age between 70 and 74	NUTS3	1155	0	0
population - female - age between 75 and 79	NUTS3	1155	0	0
population - female - age between 80 and 84	NUTS3	1155	0	0
population - female - age between 85 and 89	NUTS3	1155	0	0
population - female - age greater than or equal to 90	NUTS3	1155	0	0
population - female - age unknown	NUTS3	1155	0	0
population - male	NUTS3	1155	0	0
population - male - age less than 5	NUTS3	1155	0	0

population - male - age between 5 and 9	NUTS3	1155	0	0
population - male - age between 10 and 14	NUTS3	1155	0	0
population - male - age between 15 and 19	NUTS3	1155	0	0
population - male - age between 20 and 24	NUTS3	1155	0	0
population - male - age between 25 and 29	NUTS3	1155	0	0
population - male - age between 30 and 34	NUTS3	1155	0	0
population - male - age between 35 and 39	NUTS3	1155	0	0
population - male - age between 40 and 44	NUTS3	1155	0	0
population - male - age between 45 and 49	NUTS3	1155	0	0
population - male - age between 50 and 54	NUTS3	1155	0	0
population - male - age between 55 and 59	NUTS3	1155	0	0
population - male - age between 60 and 64	NUTS3	1155	0	0
population - male - age between 65 and 69	NUTS3	1155	0	0
population - male - age between 70 and 74	NUTS3	1155	0	0
population - male - age between 75 and 79	NUTS3	1155	0	0
population - male - age between 80 and 84	NUTS3	1155	0	0
population - male - age between 85 and 89	NUTS3	1155	0	0
population - male - age greater than or equal to 90	NUTS3	1155	0	0

population - male - age unknown	NUTS3	1155	0	0
number of buildings - Germany	LAU	11087	0	0
number of residential buildings - Germany	LAU	11087	0	0
number of residential buildings - Poland	NUTS3	73	0	0
number of non-residential buildings - Germany	LAU	11087	0	0
residential footprint area - Germany	LAU	11087	0	0
residential footprint area per building - Germany		11087	0	0
non-residential footprint area - Germany		11087	0	0
non-residential footprint area per building - Germany		11087	0	0
residential heat demand - Germany		11087	0	0
residential heat demand per building - Germany		11087	0	0
residential energy demand - Germany	LAU	11087	0	0
residential energy demand from solids - Germany	LAU	11087	0	0
residential energy demand from liquified petroleum gas - Germany	LAU	11087	0	0
residential energy demand from gas or diesel oil including biofuels - Germany	LAU	11087	0	0
residential energy demand from gases including biogas - Germany	LAU	11087	0	0

residential energy demand from biomass and wastes - Germany	LAU	11087	0	0
residential energy demand from geothermal energy - Germany	LAU	11087	0	0
residential energy demand from derived heat - Germany	LAU	11087	0	0
residential energy demand from electricity - Germany	LAU	11087	0	0
residential rooftop PV potential capacity - Germany	LAU	11087	0	0
non-residential rooftop PV potential capacity - Germany	LAU	11087	0	0
number of chemical industries	LAU	95314	0	0
electricity demand of chemical industries	LAU	95314	0	0
fuel demand of chemical industries	LAU	95314	0	0
number of iron and steel industries	LAU	95314	0	0
electricity demand of iron and steel industries	LAU	95314	0	0
fuel demand of iron and steel industries	LAU	95314	0	0
number of non-ferrous metal industries	LAU	95314	0	0
electricity demand of non-ferrous metal industries	LAU	95314	0	0
fuel demand of non-ferrous metal industries	LAU	95314	0	0
number of non-metallic mineral industries	LAU	95314	0	0
electricity demand of non-metallic mineral industries	LAU	95314	0	0

fuel demand of non-metallic mineral industries	LAU	95314	0	0
number of paper and printing industries	LAU	95314	0	0
electricity demand of paper and printing industries	LAU	95314	0	0
fuel demand of paper and printing industries	LAU	95314	0	0
number of refineries	LAU	95314	0	0
electricity demand of refineries	LAU	95314	0	0
fuel demand of refineries	LAU	95314	0	0
quality of life index	NUTS3	1155	0	0
vulnerability to natural hazards	NUTS3	1155	0	0
susceptibility to natural hazards	NUTS3	1155	0	0
coping capacity to natural hazards	NUTS3	1155	0	0
statistical area	NUTS3	1155	0	0
deaths	NUTS3	1155	0	0
employment - nace sector A	NUTS3	1155	32	2.77
employment - nace sector B-E	NUTS3	1155	32	2.77
employment - nace sector C	NUTS3	1155	32	2.77
employment - nace sector F	NUTS3	1155	32	2.77

employment - nace sector G-I	NUTS3	1155	520	45.02
employment - nace sector J	NUTS3	1155	521	45.11
employment - nace sector K	NUTS3	1155	521	45.11
employment - nace sector L	NUTS3	1155	521	45.11
employment - nace sector M_N	NUTS3	1155	520	45.02
employment - nace sector O-Q	NUTS3	1155	520	45.02
employment	NUTS3	1155	32	2.77
employment - male - age between 15 to 64	NUTS2	232	0	0
employment - female - age between 15 to 64	NUTS2	232	0	0
employment - male - age between 15 to 64 - agriculture	NUTS2	232	0	0
employment - female - age between 15 to 64 - agriculture	NUTS2	232	0	0
employment - male - age between 15 to 64 - manufacturing	NUTS2	232	0	0
employment - female - age between 15 to 64 - manufacturing	NUTS2	232	0	0
employment - male - age between 15 to 64 - transportation	NUTS2	232	0	0
employment - female - age between 15 to 64 - transportation	NUTS2	232	0	0
gross domestic product	NUTS3	1155	32	2.77
gross value added - nace sector A	NUTS3	1155	32	2.77
gross value added - nace sector B-E	NUTS3	1155	32	2.77

gross value added - nace sector C	NUTS3	1155	32	2.77
gross value added - nace sector F	NUTS3	1155	32	2.77
gross value added - nace sector G-I	NUTS3	1155	593	51.34
gross value added - nace sector J	NUTS3	1155	593	51.34
gross value added - nace sector K	NUTS3	1155	593	51.34
gross value added - nace sector L	NUTS3	1155	635	54.98
gross value added - nace sector M_N	NUTS3	1155	593	51.34
gross value added - nace sector O-Q	NUTS3	1155	593	51.34
gross value added	NUTS3	1155	32	2.77
gross value added growth	NUTS2	463	1	0.22
live births	NUTS3	1155	0	0
volume of freight transport relative to gdp	NUTS0	27	1	3.7
total investment	NUTS0	27	0	0
business investment	NUTS0	27	1	3.7
real labour productivity	NUTS2	232	1	0.43
labour productivity in agriculture	NUTS0	27	0	0
labour productivity in manufacturing	NUTS0	27	0	0
labour productivity in transportation	NUTS0	27	0	0

capital stock in agriculture	NUTS0	27	4	14.81
capital stock in manufacturing	NUTS0	27	5	18.52
capital stock in transportation	NUTS0	27	4	14.81
wages in agriculture	NUTS2	232	1	0.43
wages in manufacturing	NUTS2	232	1	0.43
wages in transportation	NUTS2	232	1	0.43
production value in agriculture	NUTS2	232	7	3.02
subsidies on products in agriculture	NUTS2	232	45	19.4
taxes on products in agriculture	NUTS2	232	14	6.03
soil erosion by water in agriculture	NUTS3	1155	1	0.09
total participation rate in education and training in last 4 weeks	NUTS2	232	0	0
female participation rate in education and training in 4 weeks	NUTS2	232	0	0
male participation rate in education and training in 4 weeks	NUTS2	232	0	0
number of small businesses	NUTS3	1155	519	44.94
number of large businesses	NUTS3	1155	519	44.94
total number of businesses	NUTS3	1155	519	44.94
production growth	NUTS0	27	0	0
road network	NUTS2	232	53	22.84

rail network	NUTS2	232	60	25.86
air transport of freight	NUTS2	232	67	28.88
air transport of passengers	NUTS2	232	67	28.88
maritime transport of freight	NUTS2	232	123	53.02
maritime transport of passengers	NUTS2	232	151	65.09
road transport of freight	NUTS3	1155	3	0.26
utility PV potential area - Germany	LAU	11087	0	0
utility PV potential capacity - Germany	LAU	11087	0	0
onshore wind potential capacity - Germany	LAU	11087	0	0
utility PV installed area	LAU	95314	0	0
utility PV installed capacity	LAU	95314	0	0
number of dwellings - Poland	NUTS3	73	0	0
number of dwelling rooms - Poland	NUTS3	73	0	0
useful floor area of dwellings - Poland	NUTS3	73	0	0
number of hydro water reservoir plants	LAU	95314	0	0
generation capacity of hydro water reservoir plants	LAU	95314	0	0
number of fossil gas plants	LAU	95314	0	0
generation capacity of fossil gas plants	LAU	95314	0	0

number of hydro run-of-river and poundage plants	LAU	95314	0	0
generation capacity of hydro run-of-river and poundage plants	LAU	95314	0	0
number of fossil hard coal plants	LAU	95314	0	0
generation capacity of fossil hard coal plants	LAU	95314	0	0
number of hydro pumped storage plants	LAU	95314	0	0
generation capacity of hydro pumped storage plants	LAU	95314	0	0
number of fossil oil plants	LAU	95314	0	0
generation capacity of fossil oil plants	LAU	95314	0	0
number of biomass plants	LAU	95314	0	0
generation capacity of biomass plants	LAU	95314	0	0
number of fossil brown coal or lignite plants	LAU	95314	0	0
generation capacity of fossil brown coal or lignite plants	LAU	95314	0	0
number of nuclear plants	LAU	95314	0	0
generation capacity of nuclear plants	LAU	95314	0	0
number of wind offshore plants	LAU	95314	0	0
generation capacity of wind offshore plants	LAU	95314	0	0
number of wind onshore plants	LAU	95314	0	0
generation capacity of wind onshore plants	LAU	95314	0	0

number of fossil coal-derived gas plants	LAU	95314	0	0
generation capacity of fossil coal-derived gas plants	LAU	95314	0	0
number of waste plants	LAU	95314	0	0
generation capacity of waste plants	LAU	95314	0	0
number of fossil oil shale plants	LAU	95314	0	0
generation capacity of fossil oil shale plants	LAU	95314	0	0
number of solar plants	LAU	95314	0	0
generation capacity of solar plants	LAU	95314	0	0
number of fossil peat plants	LAU	95314	0	0
generation capacity of fossil peat plants	LAU	95314	0	0
number of marine plants	LAU	95314	0	0
generation capacity of marine plants	LAU	95314	0	0
number of geothermal plants	LAU	95314	0	0
generation capacity of geothermal plants	LAU	95314	0	0
number of other plants	LAU	95314	0	0
generation capacity of other plants	LAU	95314	0	0
railway length with power source - unknown	LAU	95314	0	0
railway length with power source - electrified track	LAU	95314	0	0

railway length with power source - overhead electrified	LAU	95314	0	0
railway length with power source - non-electrified	LAU	95314	0	0
emission factor of gasoline	NUTS0	27	0	0
emission factor of diesel	NUTS0	27	0	0
emission factor of natural gas	NUTS0	27	0	0
emission factor of liquefied petroleum gas	NUTS0	27	0	0
emission factor of natural gas liquids	NUTS0	27	0	0
emission factor of lignite	NUTS0	27	0	0
emission factor of anthracite	NUTS0	27	0	0
emission factor of other bituminous coal	NUTS0	27	0	0
emission factor of sub-bituminous coal	NUTS0	27	0	0
emission factor of peat	NUTS0	27	0	0
emission factor of municipal wastes - non-biomass fraction	NUTS0	27	0	0
occupancy - LDV	NUTS0	27	0	0
occupancy - 2W	NUTS0	27	0	0
occupancy - bus	NUTS0	27	0	0
occupancy - HDVL	NUTS0	27	0	0

occupancy - HDVM	NUTS0	27	0	0
occupancy - HDVH	NUTS0	27	0	0
utilization rate - LDV	NUTS0	27	0	0
utilization rate - 2W	NUTS0	27	0	0
utilization rate - bus	NUTS0	27	0	0
utilization rate - HDV	NUTS0	27	0	0
waste from households - batteries and accumulators - hazardous - Poland	NUTS3	73	0	0
waste from other sources - batteries and accumulators - hazardous - Poland	NUTS3	73	0	0
waste total - batteries and accumulators - hazardous - Poland	NUTS3	73	0	0
waste from households - batteries and accumulators - total - Poland	NUTS3	73	0	0
waste from other sources - batteries and accumulators - total - Poland	NUTS3	73	0	0
waste total - batteries and accumulators - total - Poland	NUTS3	73	0	0
waste from households - biodegradable - Poland	NUTS3	73	0	0
waste from other sources - biodegradable - Poland	NUTS3	73	0	0
waste total - biodegradable - Poland	NUTS3	73	0	0
waste from households - bulky waste - Poland	NUTS3	73	0	0

waste from other sources - bulky waste - Poland	NUTS3	73	0	0
waste total - bulky waste - Poland	NUTS3	73	0	0
waste from households - composite packaging - Poland	NUTS3	73	0	0
waste from other sources - composite packaging - Poland	NUTS3	73	0	0
waste total - composite packaging - Poland	NUTS3	73	0	0
waste from households - glass - Poland	NUTS3	73	0	0
waste from other sources - glass - Poland	NUTS3	73	0	0
waste total - glass - Poland	NUTS3	73	0	0
waste from households - hazardous - Poland	NUTS3	73	0	0
waste from other sources - hazardous - Poland	NUTS3	73	0	0
waste total - hazardous - Poland	NUTS3	73	0	0
waste from households - metals - Poland	NUTS3	73	0	0
waste from other sources - metals - Poland	NUTS3	73	0	0
waste total - metals - Poland	NUTS3	73	0	0
waste from households - mixed waste packaging - Poland	NUTS3	73	0	0
waste from other sources - mixed waste packaging - Poland	NUTS3	73	0	0
waste total - mixed waste packaging - Poland	NUTS3	73	0	0
waste from households - other - Poland	NUTS3	73	0	0

waste from other sources - other - Poland	NUTS3	73	0	0
waste total - other - Poland	NUTS3	73	0	0
waste from households - paper and cardboard - Poland	NUTS3	73	0	0
waste from other sources - paper and cardboard - Poland	NUTS3	73	0	0
waste total - paper and cardboard - Poland	NUTS3	73	0	0
waste from households - plastics - Poland	NUTS3	73	0	0
waste from other sources - plastics - Poland	NUTS3	73	0	0
waste total - plastics - Poland	NUTS3	73	0	0
waste from households - textiles - Poland	NUTS3	73	0	0
waste from other sources - textiles - Poland	NUTS3	73	0	0
waste total - textiles - Poland	NUTS3	73	0	0
waste from households - total - Poland	NUTS3	73	0	0
waste from other sources - total - Poland	NUTS3	73	0	0
waste - Poland	NUTS3	73	0	0
waste from households - waste electrical and electronic equipment - hazardous - Poland	NUTS3	73	0	0
waste from other sources - waste electrical and electronic equipment - hazardous - Poland	NUTS3	73	0	0
waste total - waste electrical and electronic equipment - hazardous - Poland	NUTS3	73	0	0

waste from households - waste electrical and electronic equipment - total - Poland	NUTS3	73	0	0
waste from other sources - waste electrical and electronic equipment - total - Poland	NUTS3	73	0	0
waste total - waste electrical and electronic equipment - total - Poland	NUTS3	73	0	0
household waste - non-hazardous	NUTS0	27	0	0
waste from households - separately collected recyclables - Germany	NUTS3	401	13	3.24
waste from households - separately collected organic waste - Germany	NUTS3	401	13	3.24
waste from households - household and bulky waste - Germany	NUTS3	401	13	3.24
waste from households - total - Germany	NUTS3	401	13	3.24
waste from households - other - Germany	NUTS3	401	13	3.24
waste water from domestic and commercial use - Germany	NUTS3	401	16	3.99
number of waste water treatment plants - Germany	NUTS3	401	16	3.99
number of disposal and treatment plants - Germany	NUTS3	401	2	0.5
amount of waste treated - Germany	NUTS3	401	4	1
amount of waste material remaining after the waste treatment - Germany	NUTS3	401	4	1
amount of hazardous waste - Germany	NUTS3	401	2	0.5
number of agricultural holdings - aerable land - Germany	NUTS3	401	5	1.25

number of agricultural holdings - permanent cropland - Germany	NUTS3	401	27	6.73
number of agricultural holdings - permanent grassland - Germany	NUTS3	401	8	2
area of agricultural holdings - aerable land - Germany	NUTS3	401	26	6.48
area of agricultural holdings - permanent cropland - Germany	NUTS3	401	115	28.68
area of agricultural holdings - permanent grassland - Germany	NUTS3	401	72	17.96
aerable land area - cereals - Germany	NUTS3	401	17	4.24
aerable land area - wheat - Germany	NUTS3	401	33	8.23
aerable land area - winter wheat including spelt and einkorn - Germany	NUTS3	401	63	15.71
aerable land area - rye and winter cereals - Germany	NUTS3	401	72	17.96
aerable land area - triticale - Germany	NUTS3	401	76	18.95
aerable land area - barley - Germany	NUTS3	401	32	7.98
aerable land area - oats - Germany	NUTS3	401	92	22.94
aerable land area - grain maize or corn-cob mix - Germany	NUTS3	401	129	32.17
aerable land area - other cereals - Germany	NUTS3	401	208	51.87
aerable land area - plants for green harvesting - Germany	NUTS3	401	24	5.99
aerable land area - silage maize or green maize - Germany	NUTS3	401	48	11.97
aerable land area - sugar beet - Germany	NUTS3	401	159	39.65

aerable land area - potatoes - Germany	NUTS3	401	122	30.42
aerable land area - oilseed crops - Germany	NUTS3	401	116	28.93
aerable land area - winter oilseed rape - Germany	NUTS3	401	135	33.67
aerable land area - legumes - Germany	NUTS3	401	95	23.69
number of cattle - Germany	NUTS3	401	35	8.73
number of milk cows - Germany	NUTS3	401	93	23.19
number of pigs - Germany	NUTS3	401	101	25.19
number of breeding sows - Germany	NUTS3	401	164	40.9
number of sheeps - Germany	NUTS3	401	65	16.21
number of poultry - Germany	NUTS3	401	81	20.2
crop yield - winter wheat - Germany	NUTS3	401	121	30.17
crop yield - rye and winter cereals - Germany	NUTS3	401	237	59.1
crop yield - winter barley - Germany	NUTS3	401	139	34.66
crop yield - spring barley - Germany	NUTS3	401	213	53.12
crop yield - oats - Germany	NUTS3	401	238	59.35
crop yield - triticale - Germany	NUTS3	401	230	57.36
crop yield - potatoes - Germany	NUTS3	401	269	67.08
crop yield - sugar beet - Germany	NUTS3	401	251	62.59
crop yield - winter oilseed rape - Germany	NUTS3	401	180	44.89

crop yield - silage maize - Germany	NUTS3	401	152	37.91
tra_vehicle-lifetime_new_freight_HDVL_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVL_CEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVL_PHEV-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVL_PHEV-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVL_ICE-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVL_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVL_ICE-gas	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVL_BEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_CEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_PHEV-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_PHEV-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_ICE-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_ICE-gas	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVM_BEV	NUTS0	27	0	0

tra_vehicle-lifetime_new_freight_HDVH_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVH_CEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVH_PHEV-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVH_PHEV-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVH_ICE-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVH_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVH_ICE-gas	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_HDVH_BEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_rail_CEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_rail_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_aviation_BEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_aviation_ICE	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_IWW_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_IWW_BEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_IWW_ICE	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_marine_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_marine_BEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_freight_marine_ICE	NUTS0	27	0	0

tra_vehicle-lifetime_new_passenger_LDV_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_LDV_ICE-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_LDV_ICE-gas	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_LDV_PHEV-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_LDV_PHEV-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_LDV_BEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_LDV_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_2W_ICE-gas	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_2W_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_2W_ICE-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_2W_BEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_2W_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_2W_PHEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_bus_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_bus_ICE-gasoline	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_bus_ICE-gas	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_bus_BEV	NUTS0	27	0	0

tra_vehicle-lifetime_new_passenger_bus_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_bus_PHEV-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_metro-tram_CEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_rail_CEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_rail_FCEV	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_rail_ICE-diesel	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_aviation_ICE	NUTS0	27	0	0
tra_vehicle-lifetime_new_passenger_aviation_BEV	NUTS0	27	0	0
income of households	NUTS2	232	5	2.16
people at risk of poverty or social exclusion - absolute numbers	NUTS2	232	87	37.5
housing cost overburden rate by poverty status - absolute numbers	NUTS0	27	0	0
electricity prices for household consumers	NUTS0	27	0	0
exposure of vulnerable people to heat waves	NUTS3	1155	0	0
terrestrial protected areas	NUTS0	27	0	0
organic crop area	NUTS0	27	1	3.7
deaths due to road injuries	NUTS0	27	0	0
deaths due to accidental poisoning by and exposure to noxious substances	NUTS2	232	0	0

deaths due to unsafe water source and sanitation	NUTS0	27	0	0
deaths due to indoor and outdoor air pollution	NUTS0	27	0	0
deaths due to infectious diseases	NUTS0	27	0	0
number of people affected by natural disasters	NUTS0	27	12	44.44
years of life lost due to air pollution	NUTS3	1155	32	2.77
average air pollution due to PM2.5	NUTS3	1155	32	2.77
average air pollution due to NO2	NUTS3	1155	32	2.77
average air pollution due to O3	NUTS3	1155	32	2.77
gender pay gap	NUTS0	27	0	0
gender equality index in politics	NUTS0	27	0	0
gini index	NUTS0	27	0	0
number of people with access to electricity	NUTS0	27	0	0
number of unemployed people	NUTS2	232	0	0
number of households with internet access	NUTS2	232	69	29.74
foreign-born population	NUTS0	27	0	0
soil sealing	NUTS3	1155	0	0
protected area	NUTS0	27	0	0
river flood depth	LAU	95314	0	0
number of motor coaches and buses and trolley	NUTS2	232	5	2.16

buses				
number of passenger cars	NUTS2	232	5	2.16
number of lorries	NUTS2	232	0	0
number of motorcycles	NUTS2	232	5	2.16
number of special vehicles	NUTS2	232	0	0
number of road tractors	NUTS2	232	0	0
number of trailers and semi-trailers	NUTS2	232	3	1.29
number of total utility vehicles	NUTS2	232	0	0
number of busses - Poland	NUTS3	73	0	0
number of lorries - Poland	NUTS3	73	0	0
number of mopeds - Poland	NUTS3	73	0	0
number of motorcycles - Poland	NUTS3	73	0	0
number of passenger cars - Poland	NUTS3	73	0	0
number of road tractors - Poland	NUTS3	73	0	0
number of agricultural or forestry tractors - Germany	NUTS3	401	1	0.25
number of passenger cars - benzene - Germany	NUTS3	401	7	1.75
number of passenger cars - diesel - Germany	NUTS3	401	7	1.75
number of passenger cars - gas including bivalent	NUTS3	401	7	1.75

number of passenger cars - hybrid - Germany	NUTS3	401	7	1.75
number of passenger cars - plug-in hybrid - Germany	NUTS3	401	7	1.75
number of passenger cars - electric - Germany	NUTS3	401	7	1.75
number of passenger cars - other fuel type - Germany	NUTS3	401	7	1.75
life expectancy at birth	NUTS2	232	0	0
number of people with good or very good perceived health	NUTS0	27	0	0
number of people with tertiary education	NUTS2	232	0	0
share of renewable energy in gross final energy consumption	NUTS0	27	0	0
number of residential buildings	NUTS3	1155	260	22.51
number of residential buildings - one dwelling	NUTS3	1155	260	22.51
number of residential buildings - two dwelling	NUTS3	1155	260	22.51
number of residential buildings - three or more dwelling	NUTS3	1155	260	22.51
number of non-residential buildings	NUTS3	1155	260	22.51
number of tourist accommodation places	NUTS2	232	0	0
tenancy	NUTS3	232	49	21.12
cost of final residential energy consumption compared to gross family income	NUTS0	27	1	3.7
percentage of people very satisfied with public transport	LAU	95314	95033	99.71

percentage of people rather satisfied with public transport	LAU	95314	95033	99.71
percentage of people rather unsatisfied with public transport	LAU	95314	95033	99.71
percentage of people not at all satisfied with public transport	LAU	95314	95033	99.71
percentage of people with unknown satifactory level with public transport	LAU	95314	95033	99.71
number of bovines	NUTS2	232	35	15.09
number of pigs	NUTS2	232	37	15.95
number of sheeps	NUTS2	232	42	18.1
number of poultry	NUTS2	232	39	16.81
number of dairy cows	NUTS2	232	35	15.09
number of laying hens	NUTS2	232	39	16.81
number of rabbits - breeding females	NUTS2	232	84	36.21
number of equidae	NUTS2	232	84	36.21
active citizenship	NUTS2	232	5	2.16
number of airports	LAU	95314	0	0
number of bicycle rental and parking places	LAU	95314	0	0
number of bus stations	LAU	95314	0	0
number of subway stations	LAU	95314	0	0
number of EV charging stations	LAU	95314	0	0

number of fuel stations	LAU	95314	0	0
number of railway stations	LAU	95314	0	0
number of ferry terminals	LAU	95314	0	0
number of hydrogen fuel stations	LAU	95314	0	0
percentage of total electricity production that comes from fossil fuels excluding coal	NUTS0	27	0	0
percentage of renewable electricity production	NUTS0	27	0	0
electricity production with natural gas	NUTS0	27	0	0
electricity production with liquid gas	NUTS0	27	0	0
electricity production with heating oil	NUTS0	27	0	0
electricity production with lignite	NUTS0	27	0	0
electricity production with coal	NUTS0	27	0	0
heat production with lignite	NUTS0	27	0	0
heat production with coal	NUTS0	27	0	0
heat production with natural gas	NUTS0	27	0	0
heat production with liquid gas	NUTS0	27	0	0
heat production with heating oil	NUTS0	27	0	0
energy demand from natural gas	NUTS0	27	0	0
energy demand from liquefied petroleum gas	NUTS0	27	0	0

energy demand from natural gas liquids	NUTS0	27	0	0
energy demand from diesel	NUTS0	27	0	0
energy demand from gasoline	NUTS0	27	0	0
energy demand from lignite	NUTS0	27	0	0
energy demand from anthracite	NUTS0	27	0	0
energy demand from other bituminous coal	NUTS0	27	0	0
energy demand from sub-bituminous coal	NUTS0	27	0	0
energy demand from peat and peat products	NUTS0	27	0	0
energy demand from non-renewable municipal waste	NUTS0	27	0	0
heat demand - residential	LAU	95314	0	0
heat demand - non-residential	LAU	95314	0	0
residential energy demand from electricity	NUTS0	27	0	0
residential energy demand from natural gas	NUTS0	27	0	0
residential energy demand from liquid gas	NUTS0	27	0	0
residential energy demand from heating oil	NUTS0	27	0	0
residential energy demand from diesel	NUTS0	27	0	0
residential energy demand from gasoline	NUTS0	27	0	0
residential energy demand from lignite	NUTS0	27	0	0
residential energy demand from coal	NUTS0	27	0	0

residential energy demand from other fossil fuels	NUTS0	27	0	0
residential energy demand from biogas	NUTS0	27	0	0
residential energy demand from plant oil	NUTS0	27	0	0
residential energy demand from biofuel	NUTS0	27	0	0
residential energy demand from other biomass	NUTS0	27	0	0
residential energy demand from solar thermal	NUTS0	27	0	0
residential energy demand from geothermal	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from electricity	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from natural gas	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from liquid gas	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from heating oil	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from diesel	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from gasoline	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from lignite	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from coal	NUTS0	27	0	0

energy demand in agriculture and forestry and fisheries from other fossil fuels	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from biogas	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from plant oil	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from biofuel	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from other biomass	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from solar thermal	NUTS0	27	0	0
energy demand in agriculture and forestry and fisheries from geothermal	NUTS0	27	0	0
energy demand of iron and steel industries from electricity	NUTS0	27	0	0
energy demand of iron and steel industries from natural gas	NUTS0	27	0	0
energy demand of iron and steel industries from liquid gas	NUTS0	27	0	0
energy demand of iron and steel industries from heating oil	NUTS0	27	0	0
energy demand of iron and steel industries from diesel	NUTS0	27	0	0
energy demand of iron and steel industries from gasoline	NUTS0	27	0	0
energy demand of iron and steel industries from lignite	NUTS0	27	0	0
energy demand of iron and steel industries from coal	NUTS0	27	0	0

energy demand of iron and steel industries from other fossil fuels	NUTS0	27	0	0
energy demand of iron and steel industries from biogas	NUTS0	27	0	0
energy demand of iron and steel industries from plant oil	NUTS0	27	0	0
energy demand of iron and steel industries from biofuel	NUTS0	27	0	0
energy demand of iron and steel industries from other biomass	NUTS0	27	0	0
energy demand of iron and steel industries from solar thermal	NUTS0	27	0	0
energy demand of iron and steel industries from geothermal	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from electricity	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from natural gas	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from liquid gas	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from heating oil	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from diesel	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from gasoline	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from lignite	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from coal	NUTS0	27	0	0

energy demand of chemical and petrochemical industries from other fossil fuels	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from biogas	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from plant oil	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from biofuel	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from other biomass	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from solar thermal	NUTS0	27	0	0
energy demand of chemical and petrochemical industries from geothermal	NUTS0	27	0	0
energy demand of non-ferrous metal industries from electricity	NUTS0	27	0	0
energy demand of non-ferrous metal industries from natural gas	NUTS0	27	0	0
energy demand of non-ferrous metal industries from liquid gas	NUTS0	27	0	0
energy demand of non-ferrous metal industries from heating oil	NUTS0	27	0	0
energy demand of non-ferrous metal industries from diesel	NUTS0	27	0	0
energy demand of non-ferrous metal industries from gasoline	NUTS0	27	0	0
energy demand of non-ferrous metal industries from lignite	NUTS0	27	0	0
energy demand of non-ferrous metal industries from coal	NUTS0	27	0	0

energy demand of non-ferrous metal industries from other fossil fuels	NUTS0	27	0	0
energy demand of non-ferrous metal industries from biogas	NUTS0	27	0	0
energy demand of non-ferrous metal industries from plant oil	NUTS0	27	0	0
energy demand of non-ferrous metal industries from biofuel	NUTS0	27	0	0
energy demand of non-ferrous metal industries from other biomass	NUTS0	27	0	0
energy demand of non-ferrous metal industries from solar thermal	NUTS0	27	0	0
energy demand of non-ferrous metal industries from geothermal	NUTS0	27	0	0
energy demand of non-metallic mineral industries from electricity	NUTS0	27	0	0
energy demand of non-metallic mineral industries from natural gas	NUTS0	27	0	0
energy demand of non-metallic mineral industries from liquid gas	NUTS0	27	0	0
energy demand of non-metallic mineral industries from heating oil	NUTS0	27	0	0
energy demand of non-metallic mineral industries from diesel	NUTS0	27	0	0
energy demand of non-metallic mineral industries from gasoline	NUTS0	27	0	0
energy demand of non-metallic mineral industries from lignite	NUTS0	27	0	0
energy demand of non-metallic mineral industries from coal	NUTS0	27	0	0

energy demand of non-metallic mineral industries from other fossil fuels	NUTS0	27	0	0
energy demand of non-metallic mineral industries from biogas	NUTS0	27	0	0
energy demand of non-metallic mineral industries from plant oil	NUTS0	27	0	0
energy demand of non-metallic mineral industries from biofuel	NUTS0	27	0	0
energy demand of non-metallic mineral industries from other biomass	NUTS0	27	0	0
energy demand of non-metallic mineral industries from solar thermal	NUTS0	27	0	0
energy demand of non-metallic mineral industries from geothermal	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from electricity	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from natural gas	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from liquid gas	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from heating oil	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from diesel	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from gasoline	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from lignite	NUTS0	27	0	0

energy demand of paper and pulp and printing industries from coal	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from other fossil fuels	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from biogas	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from plant oil	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from biofuel	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from other biomass	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from solar thermal	NUTS0	27	0	0
energy demand of paper and pulp and printing industries from geothermal	NUTS0	27	0	0
energy demand of transport equipment industries from electricity	NUTS0	27	0	0
energy demand of transport equipment industries from natural gas	NUTS0	27	0	0
energy demand of transport equipment industries from liquid gas	NUTS0	27	0	0
energy demand of transport equipment industries from heating oil	NUTS0	27	0	0
energy demand of transport equipment industries from diesel	NUTS0	27	0	0
energy demand of transport equipment industries from gasoline	NUTS0	27	0	0

energy demand of transport equipment industries from lignite	NUTS0	27	0	0
energy demand of transport equipment industries from coal	NUTS0	27	0	0
energy demand of transport equipment industries from other fossil fuels	NUTS0	27	0	0
energy demand of transport equipment industries from biogas	NUTS0	27	0	0
energy demand of transport equipment industries from plant oil	NUTS0	27	0	0
energy demand of transport equipment industries from biofuel	NUTS0	27	0	0
energy demand of transport equipment industries from other biomass	NUTS0	27	0	0
energy demand of transport equipment industries from solar thermal	NUTS0	27	0	0
energy demand of transport equipment industries from geothermal	NUTS0	27	0	0
energy demand of machinery industries from electricity	NUTS0	27	0	0
energy demand of machinery industries from natural gas	NUTS0	27	0	0
energy demand of machinery industries from liquid gas	NUTS0	27	0	0
energy demand of machinery industries from heating oil	NUTS0	27	0	0
energy demand of machinery industries from diesel	NUTS0	27	0	0
energy demand of machinery industries from gasoline	NUTS0	27	0	0
energy demand of machinery industries from lignite	NUTS0	27	0	0

energy demand of machinery industries from coal	NUTS0	27	0	0
energy demand of machinery industries from other fossil fuels	NUTS0	27	0	0
energy demand of machinery industries from biogas	NUTS0	27	0	0
energy demand of machinery industries from plant oil	NUTS0	27	0	0
energy demand of machinery industries from biofuel	NUTS0	27	0	0
energy demand of machinery industries from other biomass	NUTS0	27	0	0
energy demand of machinery industries from solar thermal	NUTS0	27	0	0
energy demand of machinery industries from geothermal	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from electricity	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from natural gas	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from liquid gas	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from heating oil	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from diesel	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from gasoline	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from lignite	NUTS0	27	0	0

energy demand of food and beverages and tobacco industries from coal	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from other fossil fuels	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from biogas	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from plant oil	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from biofuel	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from other biomass	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from solar thermal	NUTS0	27	0	0
energy demand of food and beverages and tobacco industries from geothermal	NUTS0	27	0	0
energy demand of wood and wood products industries from electricity	NUTS0	27	0	0
energy demand of wood and wood products industries from natural gas	NUTS0	27	0	0
energy demand of wood and wood products industries from liquid gas	NUTS0	27	0	0
energy demand of wood and wood products industries from heating oil	NUTS0	27	0	0
energy demand of wood and wood products industries from diesel	NUTS0	27	0	0

energy demand of wood and wood products industries from gasoline	NUTS0	27	0	0
energy demand of wood and wood products industries from lignite	NUTS0	27	0	0
energy demand of wood and wood products industries from coal	NUTS0	27	0	0
energy demand of wood and wood products industries from other fossil fuels	NUTS0	27	0	0
energy demand of wood and wood products industries from biogas	NUTS0	27	0	0
energy demand of wood and wood products industries from plant oil	NUTS0	27	0	0
energy demand of wood and wood products industries from biofuel	NUTS0	27	0	0
energy demand of wood and wood products industries from other biomass	NUTS0	27	0	0
energy demand of wood and wood products industries from solar thermal	NUTS0	27	0	0
energy demand of wood and wood products industries from geothermal	NUTS0	27	0	0
energy demand of textile and leather industries from electricity	NUTS0	27	0	0
energy demand of textile and leather industries from natural gas	NUTS0	27	0	0
energy demand of textile and leather industries from liquid gas	NUTS0	27	0	0
energy demand of textile and leather industries from heating oil	NUTS0	27	0	0
energy demand of textile and leather industries from diesel	NUTS0	27	0	0

energy demand of textile and leather industries from gasoline	NUTS0	27	0	0
energy demand of textile and leather industries from lignite	NUTS0	27	0	0
energy demand of textile and leather industries from coal	NUTS0	27	0	0
energy demand of textile and leather industries from other fossil fuels	NUTS0	27	0	0
energy demand of textile and leather industries from biogas	NUTS0	27	0	0
energy demand of textile and leather industries from plant oil	NUTS0	27	0	0
energy demand of textile and leather industries from biofuel	NUTS0	27	0	0
energy demand of textile and leather industries from other biomass	NUTS0	27	0	0
energy demand of textile and leather industries from solar thermal	NUTS0	27	0	0
energy demand of textile and leather industries from geothermal	NUTS0	27	0	0
total electricity demand	NUTS0	27	0	0

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